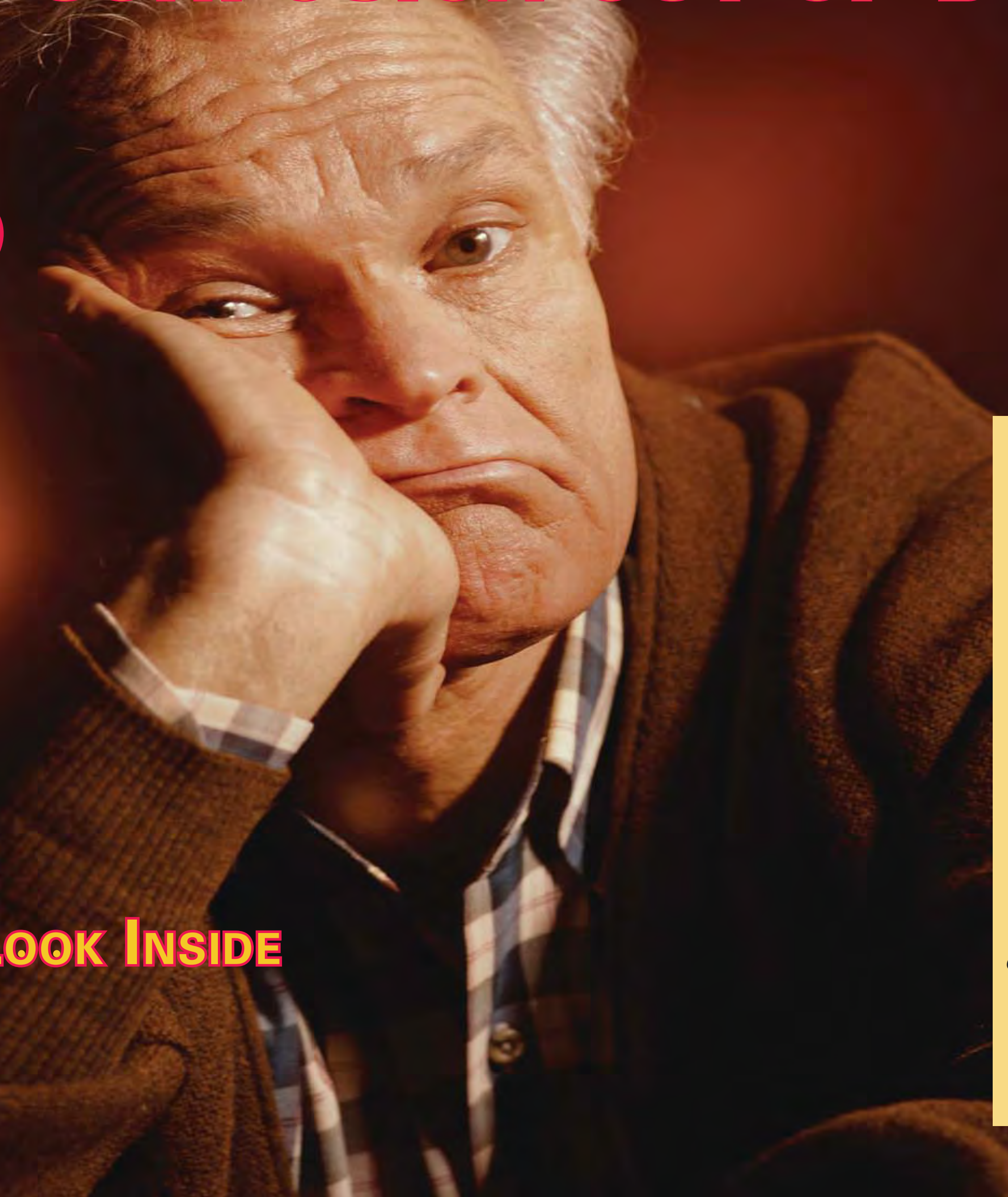
DIGITAL TV GOT YOU DOWN

TAKE THE CONFUSION OUT OF DTV / HDTV



SANYO

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1-800-877-5032

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Look Inside

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Ready or Not—The Age of Analog TV is About to End

In 1996 Congress enacted a Telecommunications Act requiring all terrestrial (over-the-air) television broadcasters to begin phasing in digital broadcasts.

Whether we are ready or not, analog TV broadcasts are about to end and be replaced with digital broadcasts. Actually, we're already well along in the process. For example, all TVs 13 inches and larger manufactured after February 2007 must have a digital tuner; Over-the-air broadcasters (aka, your local channels) are broadcasting both analog and digital signals now. On February 17, 2009, however, full-power analog broadcasts will cease. After that date only full-power digital signals will be transmitted over-the-air.

That May Cause You to Wonder…

Do I have to purchase a new digital TV? The answer is… *Not necessarily*. However, to continue to use your analog TV after February 17, 2009 with an antenna, you must connect a separate digital receiver/tuner (also know as a Set-Top Box or STB).

The U.S. Congress has allocated funds to provide many viewers with a coupon for a free STB.

Go to www.ntia.doc.gov to learn more about the digital-to-analog converter box coupon program.

Viewers that subscribe to cable or satellite service may not be affected. Contact your service provider for details.

Clarifying The Many Aspects of Digital Television

Sanyo realizes that Digital Television has mystified many viewers, sometimes making them feel that it's just too complicated to ever be understood. If that description fits you, then you need to read further. *It doesn't have to be that way!*

We created this training material to remove the mystery from Digital Television. Reading this material will help you understand Digital Television and how to choose quickly the best connections and options to fit your needs. It's time for you to feel relaxed, and begin enjoying the benefits of HDTV.

Whether you are connecting an HD Satellite receiver or simply hooking up an antenna, this material will remove the confusion and help you to *get it right the first time*.

However, That's Not the Only Consideration

Using a digital STB with your old analog TV will allow you to receive over-the-air digital broadcasts, where available, but, you will miss the most exciting part of Digital TV—HDTV. To watch HDTV broadcasts in stunning high-definition, you ***must*** have a high-definition display, such as, any of our full-line of Sanyo HD DTVs.

All of This May Lead You to Ask…

What is this HDTV? I've also seen EDTV and SDTV somewhere. What do they mean? How do they differ from DTV, and by the way, what is DTV?

These are all good questions. Please read on for the answers.

DTV and HDTV Signal Basics

DTV stands for **D**igital **T**ele**V**ision. HDTV, EDTV, and SDTV represent the different DTV signal resolutions (or picture detail); HDTV is High-Definition, EDTV is Enhanced Definition, and SDTV is Standard Definition.

SDTV vs EDTV

EDTV is used to provide distinction between 480i (interlaced) scanning and 480p (progressive) scanning. Both use 480 scanning lines. The difference is in the way the lines are scanned onto the TV screen.

With "interlaced" two fields of video are scanned then "interlaced" (or combined) together to make one frame of video (one complete image). In progressive scanning, each line of video is scanned "progressively" or sequentially, eliminating the need to interlace fields together.

Both of these scanning methods can produce frames at a rate of 30 frames per second.

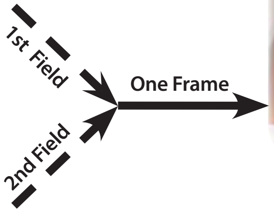
Being interlaced or progressively scanned has some affect on image resolution. However, the main factor influencing resolution is the number of actual scanning lines (480, 720, or 1080).

The primary advantage of progressive scanning over interlaced occurs during scenes that change quickly, such as, in sporting events or fast-paced action movies.

Analog broadcasts are limited to just 480i resolution.

All Sanyo LCD DTVs use progressive scanning for the best picture.

During the first scan (1st field) of an interlaced image the odd numbered lines are scanned onto the screen (1, 3, 5, etc...).



First and second fields are interlaced (combined) together to make one complete frame (image).

A progressively scanned image achieves the same result with only one scan, eliminating what is commonly referred to as "interlace flicker" or the "jaggies," which occurs due to the time delay between the first and second fields.

Well then, if that's the case, what do 480i, 480p, 720p, 1080i, and 1080p mean? How do they fit in? I thought they represented the different resolutions of DTV.

That's true, they do.

It's just another way of describing picture resolution. 480, 720, and 1080 represent the visible scan lines on a TV screen; 720 lines and 1080 lines are both classified as high-definition (HDTV) signals. Where 480 lines is classified as either standard (SDTV) or enhanced definition (EDTV).

During the second scan (2nd field) of an interlaced image the even numbered lines are scanned onto the screen (2, 4, 6, etc...).

Not actual TV image.
Representative image only

Scan lines have been enlarged for demonstration purposes.

The Four Essential Elements of HDTV

The following four elements are essential to true HDTV viewing. *If even one Essential Element is missing, you will simply miss the full HDTV experience.*

1) A High-Definition Digital Television, such as a Sanyo HD DTV, to display the fantastic HD imagery of true high-definition broadcasts.

2) A high-definition signal.

The DTV ***must*** receive a high-definition signal from at least one of the following ***external*** sources:

a. An antenna connected to the Digital Antenna In terminal; and/or,

b. A subscription to high-definition digital television service, such as, HD Digital Cable or HD Satellite Service.

The HD Cable box, HD Satellite receiver, or other external HD receiver must be connected to the DTV's Component (Y Pb Pr) or higher resolution jacks (see the ***Connectors Chart*** on page 7).

For local channels you must connect an antenna to the ANT terminal. (Refer to the owner's manual or to the Hookup Diagrams on our web site for detailed instructions, www.sanyoctv.com/entertainment/television.)

3) You ***must*** tune to a station (channel) that is broadcasting an HD program. Check with your service provider or check your locals listings for availability.

4) The HD program content on the channel you select ***must*** have been created originally with high-definition equipment.

For true high-definition viewing, the programming ***must*** have been created with HD recording equipment. Programs that were not created with HD recording equipment will not appear as fantastic when "upconverted." Upconverted analog signals, when displayed in their native aspect ratio (4:3), will be "pillar boxed" on widescreen TVs, that is, they will have black or gray bars on the sides. Common sense may also tell you that an "I Love Lucy" rerun "may not actually be in hi-def."

Take Control of Your Signal!

Even though the broadcast signal content is out of your control, *you* control the "hookup" method. Choose the best connection available to ensure that the signal you receive is displayed at the highest resolution possible.

Putting it All Together

Now that you understand some digital TV terms and the importance of the signal, let's look at where and how digital signals can or should be used.

But Before You Jump In

We cannot emphasize enough the importance of the signal you connect to the DTV. So before you begin connecting your external equipment, let's revisit some signal standards.

For example, using the yellow, white and red AV jacks to connect your Progressive Scan DVD player ***is never the best choice.*** Neither is purchasing a wonderful Sanyo high-definition DTV and then connecting it to a standard resolution signal, such as analog cable.

If you have not upgraded your signal to Digital, you will not experience the clear digital images a Sanyo LCD HDTV can display. Furthermore, to expand your viewing to include HDTV, you must upgrade your signal to HD Digital. *A great TV deserves a great signal.*

The Signal makes the difference!

Don't Be Confused by the Phrase *"In High-Definition, where available"*

Many people are misled into believing that a new digital TV is all they need to view high-definition programming. There are many reasons for this confusion. But according to some surveys, the top four (4) are: 1) misrepresentation by sales personnel, 2) flashy advertising, 3) a program's opening banner that may read "In *High-Definition, where available*," and 4) by the brighter picture a new DTV may have.

Because of this confusion, many customers just connect their new DTV to their old analog cable or basic satellite service and expect to "get HDTV."

Nothing could be further from the truth. These connections will not allow your high-definition DTV to perform up to its potential. It would be like buying an expensive high-performance sports car and using regular gasoline. You wouldn't *feel* the performance you expected.

To *see* the performance you expect from your new Sanyo high-definition DTV, when connected to cable or satellite service, you *must:*

1) Subscribe to High-Definition Digital Cable or High-Definition Satellite service.

2) Connect the HD receiver to input jacks capable of receiving HD content, such as, Component (Y Pb Pr).

For Local Digital Channels:

3) You ***must*** connect an antenna to the Antenna (ANT) terminal. Then follow the instructions in the owner's manual to automatically program in your local channels.

Don't Miss Out—Get the Best Images Possible

If you are a cable or satellite customer and haven't done so already, Sanyo recommends that you contact your provider and upgrade to HD Digital service. *Do it today!* When you experience the realism of high-definition on your Sanyo LCD HDTV, *you will be glad you did.*

After upgrading your signal to HD Digital, follow the instructions in the owner's manual that came with your new Sanyo DTV or use Hookup Diagrams on our web site to connect your Sanyo high-definition DTV for optimum performance.

Know what it's like—Don't be bored by the same old dull images any longer. *Get into the excitement of Sanyo and HDTV!*

Use the Charts to Assure Best Results

The ***Connectors Chart*** on page 7 and the ***Cross-Reference Chart*** on page 8 identify and explain every option that can be used to connect external equipment to a Sanyo DTV. They also indicate which connections provide the best picture from each device.

Study these charts carefully: Identify the best connections available on your external equipment: Learn the advantages and disadvantages of each connection type. Then review the available output jacks on your external equipment and choose the best option for each device you are connecting.

Use the ***External Connection Guide*** on page 9 to plan the best connections possible between your external equipment and your Sanyo high-definition DTV.

Then relax with family or friends and enjoy the best that TV programmers have to offer, all on your new Sanyo widescreen LCD HDTV.

Glossary of TV Terms

Analog—Commonly refers to the current NTSC transmission standard for televisions.

Aspect Ratio—The ratio of the width to the height of a TV screen independent of the screen size (x units wide by x units high). Analog is 4:3; Digital can be 4:3 or 16:9 (commonly referred to as widescreen).

ATSC—Advanced Television Systems Committee

AV Jacks—Audio Video Jacks

Bandwidth—The range of frequencies assigned to a broadcast channel. A TV channel is 6 MHz (megahertz) wide.

Component Jacks (Y Pb Pr)—Green, Blue, and Red video jacks that carry 480i, 480p, 720p, and 1080i signals. By separating the Green (Y), Blue (Pb), and Red (Pr) video signal components, clearer, more-defined images that exceed the performance of S-Video and Composite video jacks are achieved.

Composite Jacks—White, Red, and Yellow AV jacks. The White and Red jacks carry the Left and Right audio signals while the Yellow jack carries the composite video signal.

Dolby® Digital (Formally known as Dolby AC-3)—A 5.1 channel (Front L/R, Rear L/R, Center, and Bass) surround sound audio standard for digital television.

Downconverting—The removal of pixels. Frame rate and/or scanning format may also change. Broadcasters may use this process to make room in their bandwidth for additional services, such as, sub-channels.

DTV (Digital Television)—Comprises four elements, HDTV, EDTV, SDTV, and Multicasting.

DVI—Digital Visual Interface. A pure digital video interface that can pass standard-definition and high-definition video signals. It supports the HDCP copy protection standard, allowing transmission of copy-protected digital content.

EDTV—Enhanced-Definition TV (480p)

HDMI—High-Definition Multimedia Interface. An all digital audio/video interface that accepts uncompressed video signals for the very best picture possible. It supports the HDCP copy protection standard, allowing transmission of copy-protected digital content. The signal can also include Dolby® Digital or PCM audio, when available.

HDTV—High-Definition TV (720p, 1080i, & 1080p), commonly referred to as "hi-def" or "HD."

Input / Output Jacks—Used to receive (input) and send (output) signals from one device to another. Such as, from a DVD player (Output) to the TV (Input).

Interlaced Scanning—The process of scanning two fields of video then combining (interlacing) them to make one frame of video (or one complete image).

Letter Box—This term is used to describe a 16:9 ratio image being displayed on a 4:3 ratio display device. Black bands appear at the top and bottom of the screen.

MPEG2 / MPEG4—Compression schemes for moving images and audio. Developed by the Motion Picture Experts Group, these make HDTV and multicasting possible.

Multicasting—The dividing of a station's broadcast signal into sub-channels of programming or data services. The resolution of the main channel must be reduced to make room for sub-channels.

NTSC—National Television Systems Committee

Pillar Boxing—This term is used to describe a 4:3 ratio image being displayed on a 16:9 ratio display device. Black or gray bars (or pillars) appear at the sides of the screen.

Pixel—Picture Element

Progressive Scanning—The process of scanning lines sequentially. One scan produces one frame of video (or one complete image).

Set-Top Box (STB)—A device that receives and converts signals for display on a television screen or video monitor (can be digital or analog). Many digital STBs have cable and over-the-air tuners.

SDTV—Standard-Definition TV (480i), commonly referred to as "SD"

Signal—The picture, sound, and data transmitted or received through the air to an antenna, over a Cable TV system, from a Satellite to a dish and receiver, or between external components of an Audio/Video system.

Simulcast—Simultaneously broadcasting the same program on two or more channels. This is required by the FCC during the transition from analog to digital. Simulcasting is scheduled to end and only digital broadcasts will continue after February 17, 2009.

S-Video Jack—A round 4-pin jack that accepts separated luminance and chroma signals from a DVD player, Super VHS VCR, or similar analog device. The resolution of this input exceeds that of a composite video input (yellow connector), but is lesser than the resolution of component inputs (Y Pb Pr).

Terrestrial—An over-the-air broadcast to an antenna.

Upconverting—A process of converting original analog programming to digital for DTV broadcasting. Pixels may be duplicated and inserted between existing pixels to simulate HDTV. This does not increase the resolution. The resolution of an image is set during the recording process. It cannot be increased through conversion processes.

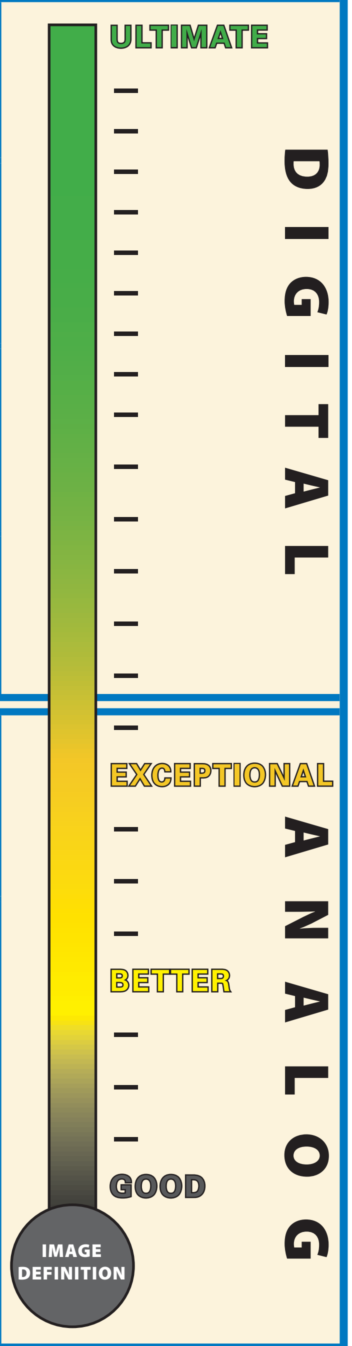
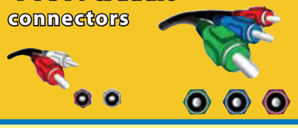
Widescreen—Used to describe a 16:9 or greater aspect ratio. 16:9 is the standard aspect ratio for HDTV digital displays. Movies screens are often slightly wider.

Common Questions Answered

When will over-the-air analog broadcasts end?
Congress set the shutoff date for February 17, 2009.

Will my current analog TV work after that date?
Yes. Consumers will be able to connect a digital STB to their existing TV to receive over-the-air DTV broadcasts, where available, however, not in high-definition. Analog TVs should continue to work with Cable boxes, Satellite receivers, VCRs, and DVD players for many years to come.

COMMON CABLES & CONNECTORS VS IMAGE DEFINITION

CONNECTORS	THEIR FUNCTION	AVAILABLE SIGNALS	PIX-O-METER
75 OHM COAX (DIGITAL RF)	Carries off-air digital broadcast signals (channels) from an antenna to the DTV. For the ultimate resolution of local high-definition broadcasts.	480i, 480p, 720p, or 1080i digital signals (depends on the broadcast signal). *(LCD and Plasma models convert 480i, 480p, and 1080i signals to 720p, for display.)	
HDMI	Uses just one cable to transfer full-bandwidth digital video and audio, for the ultimate in picture resolution. Can be used to connect a DVD player/recorder, game system, HD Cable box, HD Satellite receiver, or other similar device.	480p, 720p, or 1080i digital video and audio signals (depends on the output device and/or your subscription service). *(LCD and Plasma models convert 480i, 480p, and 1080i signals to 720p, for display.)	
DVI (& audio connectors)	Transfers full-bandwidth digital video for the ultimate resolution. Can be used to connect a DVD player/recorder, Game system, HD Cable box, HD Satellite receiver, or other similar device. (Connect it to the HDMI Input1 jack using an adapter [not supplied]. Separate analog audio connections are required.)	480p, 720p, or 1080i digital video signals (depends on the output device and/or your subscription service). *(LCD and Plasma models convert 480i, 480p, and 1080i signals to 720p, for display.)	
DIGITAL AUDIO (Coaxial w/phono connector)	Used to transfer digital audio signals. (Digital audio is available for output from the DTV to an AV receiver only when received as part of the digital antenna signal that is being viewed on the screen.)	Multichannel audio, such as, 5.1 channels of surround sound, when received as part of the original digital antenna signal that is being viewed on the screen.	
COMPONENT Y Pb Pr & audio connectors 	Transfers individual Green, Blue, and Red analog signals for exceptional resolution. Can be used to connect a DVD player/recorder, Game system, HD Cable box, HD Satellite receiver, or other similar device. (Separate analog audio connections are required.)	480i, 480p, 720p, or 1080i analog signals (depends on the output device and/or your subscription service). *(LCD and Plasma models convert 480i, 480p, and 1080i signals to 720p, for display.)	
S-VIDEO & audio connectors	Transfers separated analog luminance and chroma signals from your S-Video equipped device to the TV for better picture resolution. *Due to severe HD resolution limitations, Sanyo recommends strongly that you not use this option to connect HD equipment to your Sanyo HD DTV.* (Separate analog audio connections are required.)	480i (standard analog) *(LCD and Plasma models convert 480i signals to 720p, for display.)	
COMPOSITE (audio / video connectors)	Transfers a composite analog luminance and chroma signal (yellow connector) from a VCR, or similar device, to the TV. (Left and Right audio signals are carried by the White and Red connectors respectively.) *Due to severe resolution limitations, Sanyo recommends strongly that you not use this option to connect HD equipment to your Sanyo HD DTV.*	480i (standard analog) *(LCD and Plasma models convert 480i signals to 720p, for display.)	

*Conversion of 480i, 480p, and 1080i signals to 720p for display does not increase nor decrease the resolution. The maximum resolution a high-definition DTV can display depends on the input signal.

EXTERNAL EQUIPMENT-TO-DTV CONNECTION CROSS-REFERENCE

BROADCAST AND PURCHASED SIGNAL SOURCES / OTHER SIGNAL SOURCES

USE THE BEST CONNECTION AVAILABLE

‡EXTERNAL EQUIPMENT YOU MAY HAVE	‡MY SANYO HIGH-DEFINITION DTV MAY HAVE THESE CONNECTORS							
	*DIGITAL RF	HDMI (INPUT1, 2 & 3) (** Connect A DVI Device to INPUT1 only) HDMI to DVI Adapter Cable	**COMPONENT (VIDEO2 & VIDEO3)	**S-VIDEO (VIDEO1)	**COMPOSITE (VIDEO1)	*ANALOG RF	DIGITAL COAX OUT	AUDIO OUTPUT
ANTENNA								
*Digital	■						Yes[1]	Yes
*Analog						■	No	No
DIGITAL CABLE								
*HD Receiver		■	■	***		***	No	Yes[2]
*Standard Receiver				■ or	■	■	No	Yes[2]
SATELLITE								
*HD Receiver		■	■	***		***	No	Yes[2]
*Standard Receiver				■ or	■	■	No	Yes[2]
ANALOG CABLE								
*With Box				■ or	■	■	No	Yes[2]
Without Box						■	No	No
DVD PLAYER		■	■	***			No	Yes[2]
DVD RECORDER		■	■	***		***	No	Yes[2]
GAME SYSTEM		■	■	■ or	■	■	No	Yes[2]
VCR or VIDEO CAMERA				■ or	■	■	No	Yes[2]
AV RECEIVER	Connect the Digital Audio Out and Audio Output to your AV Receiver. NOTE: You may also want to connect the Digital Audio Out and Audio Out from any external equipment you have to your AV Receiver (when available).						Yes[1]	Yes[2]
IMAGE DEFINITION		ULTIMATE	EXCEPTIONAL	BETTER	GOOD	BASIC		

DIGITAL ■

ANALOG ■ ■ ■ ■

‡ The number and types of video connections vary by equipment and model, but may include (HDMI, Component, and Composite or S-Video), plus an RF terminal.

* Connect an antenna to receive analog and digital off-air signals, where available; or connect a Cable box, VCR, or similar device (these connections are analog only).

** Requires separate analog audio connections.

*** This hook-up can be used, but, it will reproduce significantly lower picture quality, and is therefore, not recommended by Sanyo for this device. If necessary, upgrade your external equipment.

[1] When received as part of the digital antenna signal viewed on the screen.

[2] Mono only with analog RF signal.

EXTERNAL CONNECTIONS PLAN

Use this chart and your external device's owner's manuals and User's Guides to plan and record your connections.

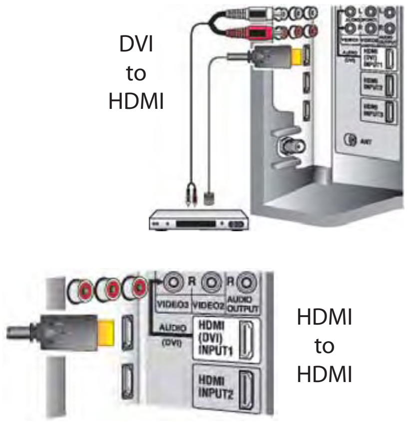
For each input / output, click the box beside the device you want to connect.

Then use the completed chart as a guide when making your connections.

ANTENNA IN
(Analog/Digital RF Coax)

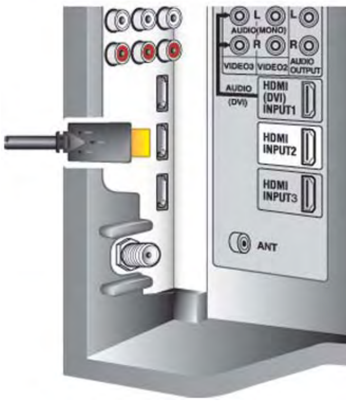
- ☐ Antenna
- ☐ Antenna / VCR
- ☐ ANT / DVD Recorder

INPUT1 HDMI or DVI (adapter & audio connections required for DVI)



- ☐ HD Satellite Receiver
- ☐ DVD Player
- ☐ HD Cable Box
- ☐ Game System
- ☐ DVD Recorder
- ☐ AV Receiver

INPUT2
(HDMI)



- ☐ HD Satellite Receiver
- ☐ DVD Player
- ☐ HD Cable Box
- ☐ Game System
- ☐ DVD Recorder
- ☐ AV Receiver

INPUT3
(HDMI)

- ☐ HD Satellite Receiver
- ☐ DVD Player
- ☐ HD Cable Box
- ☐ Game System
- ☐ DVD Recorder
- ☐ AV Receiver

VIDEO3
(COMPONENT)

- ☐ HD Satellite Receiver
- ☐ DVD Player
- ☐ HD Cable Box
- ☐ Game System
- ☐ DVD Recorder
- ☐ AV Receiver

VIDEO2
(COMPONENT)

- ☐ HD Satellite Receiver
- ☐ DVD Player
- ☐ HD Cable Box
- ☐ Game System
- ☐ DVD Recorder
- ☐ AV Receiver

VIDEO1
(S-VIDEO)

- ☐ Sat. Rec.
- ☐ VCR
- ☐ Cable Box
- ☐ Game
- ☐ DVD
- ☐ AV Receiver

VIDEO1
(COMPOSITE)

- ☐ Sat. Rec.
- ☐ VCR
- ☐ Cable Box
- ☐ Game
- ☐ DVD
- ☐ AV Receiver

DIGITAL AUDIO OUT
(COAXIAL)

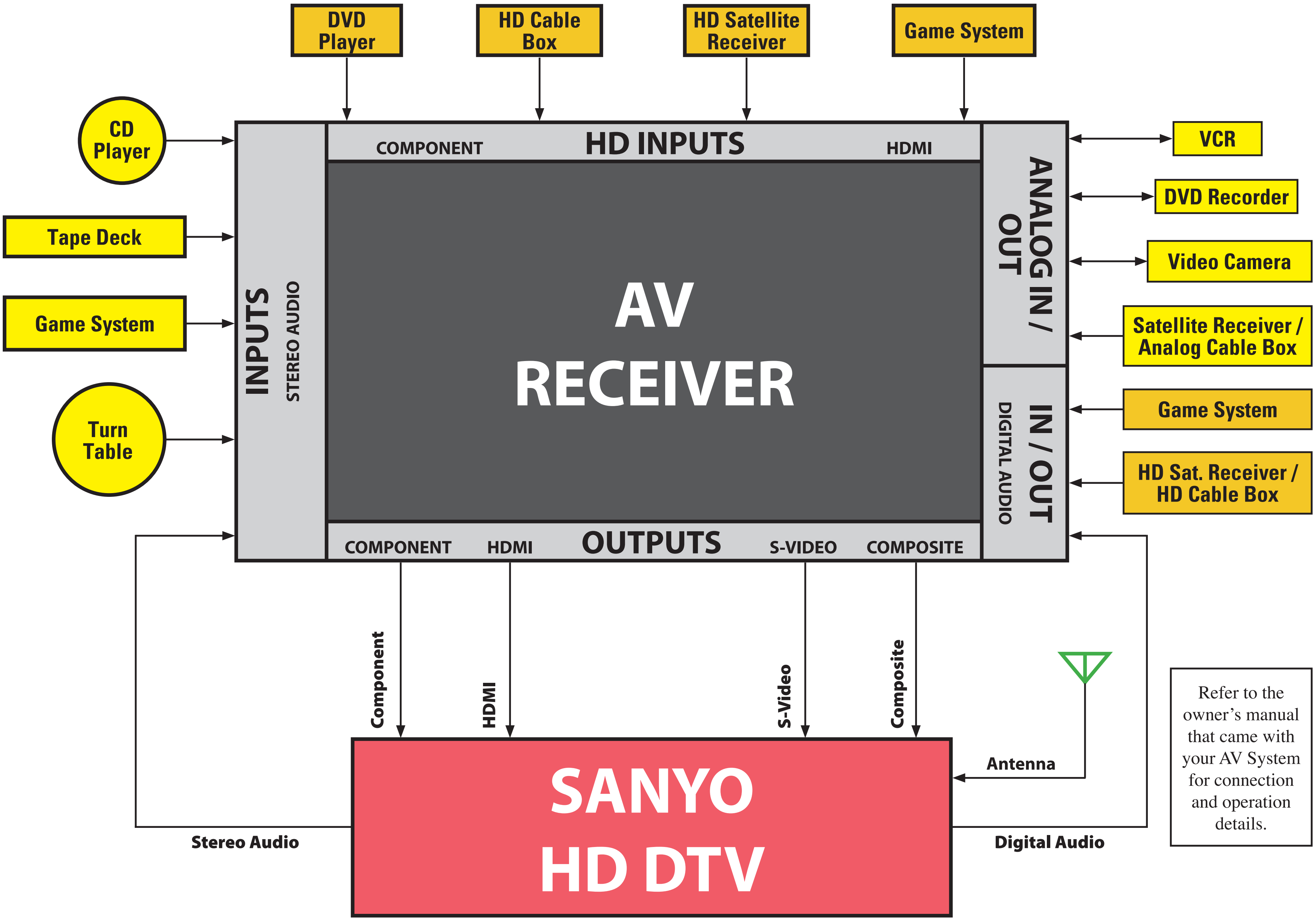
- ☐ Stereo Amplifier
- ☐ AV Receiver
- ☐ Other ____________

AUDIO OUTPUT
(STEREO)

- ☐ Stereo Amplifier
- ☐ AV Receiver
- ☐ Other ____________

Refer to the owner's manuals and user's guides that came with your external equipment for specific device connection options, all jacks may not be available on all models.

SIMPLIFIED AV RECEIVER SYSTEM HOOKUP



Refer to the owner's manual that came with your AV System for connection and operation details.